Cotton, St James

Oct. 1919 - (011)

122

DU PONT

ANESTHESIA ETHER

(Cotton Process)

An improved Anesthesia Ether having also the properties of a general Analgesic.

DU PONT CHEMICAL WORKS

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E. I. DU PONT DE NEMOURS & COMPANY

Wilmington, Delaware

DU PONT

ANESTHESIA ETHER

(COTTON-PROCESS)

ONE of the important branches of our manufacturing activities is that concerned with the production of sulphuric ether, or, as it is technically designated, di-ethyl ether. For many years we have been making this useful chemical in vast quantities as an essential material in the manufacture of smokeless powder, and for a somewhat shorter time in large and continually increasing volumes expressly for anesthesia purposes.

Although it is true that the same chemical compound is used as an industrial solvent and as an anesthetic, it is, of course, well known to everyone in any way familiar with the subject that there is a great difference in refinement between the two ethers, the difference being so great in fact as to require radically different methods of manufacture. The transition from one field of application to the other called into service the best efforts of our chemical and medical experts and skilled factory operators, and even after the problem appeared to be solved and Du Pont Anesthesia Ether was being sold throughout the United States and abroad, the work of these investigators continued, and it still goes on. It was in accord with this policy of constantly striving to improve our products and increase their sphere of usefulness that one of our staff physicians was requested to attend a lecture on "New Ether" given by Dr. James Cotton at McGill University, Montreal, on June 13, 1917, and a demonstration the following day at the Royal Victoria Hospital. It was learned by our representative that Dr. Cotton had been investigating anesthesia ethers from a chemical and physiological view-

point for the past four or five years, and as a result of his study had been able to produce highly refined di-ethyl ether, so modified by the addition of certain gases as to give the product new and desirable characteristics. These in brief were: *The ability to induce and maintain analgesia* (conscious insensibility to pain) as distinguished from anesthesia (insensibility to pain plus narcosis or loss of consciousness), and the property of inducing and maintaining anesthesia without the *subsequent nausea and other troublesome effects* which commonly follow the use of ordinary anesthesia ether. The results of the demonstration were so impressive that we immediately arranged to follow out the elaborate and highly refined process of manufacture in our own laboratories. During the course of our experiments we were successful in preparing an ether having those characteristics claimed by Dr. Cotton for his "New Ether"; that is, we were able to produce an improved anesthesia ether combining the analgesic properties and freedom from after-effects described by Dr. Cotton.

It is this new type of anesthesia ether, now prepared on a commercial scale, which we offer to the medical and surgical professions as Du Pont Anesthesia Ether (Cotton-Process).

FIELD OF USEFULNESS

Anesthesia:

Our improved ether is primarily a high grade anesthesia ether which fulfills all those requirements naturally expected of such a product. Results in numerous cases where this new ether was used show that it possesses superior anesthetic power, and that the after-effects are markedly less than with other anesthesia ethers. No special procedure has to be adopted in administering this new ether for anesthesia purposes, and its range of usefulness covers all cases requiring a good anesthesia ether.

Analgesia:

We believe the future field of usefulness for this new ether, as an analgesic, will be

varied and wide. It is a general analgesic adapted to the numerous cases where insensibility to pain without loss of consciousness is desirable, not only in surgical practice where anesthesia ether is now used, but also in the many operations which are performed by surgeons and physicians with the aid of local anesthetics, or else without any attempt whatever to eliminate pain. Although much of the field remains to be explored, reports on numerous cases indicate that this ether, as an analgesic, is specially adapted to such minor surgical cases as the sewing of wounds, opening and treatment of abscesses, changing packings and dressings, and short emergency operations.

It is probably in obstetrical cases and in dentistry that the analgesic properties of this ether have been most appreciated thus far. In the former cases only a small amount of this special type of ether is required to relieve the pain, and it does not interfere at all with the progress of labor. In dentistry the ether can not only replace nitrous oxide for extractions but may also be used to render painless such operations as nerve treating, removal of roots, drilling and filling of teeth, etc., which hitherto have been performed without an anesthetic.

Before proceeding further, we wish to point out that it is sometimes impossible to obtain complete analgesia without narcosis. Cases of this character usually occur when patients are suffering from hemorrhage, anemia, syphilis, or prolonged fever. On such occasions several procedures are possible and the one to be followed should be determined by the particular circumstances:

1. The patient can be quickly revived by discontinuing administration of the ether.

2. Satisfactory results can often be obtained with obstinate analgesia cases by allowing partial recovery and then again administering the ether.

3. By continuing administration of the ether sufficiently the patient can be carried quickly through the analgesia stage into complete anesthesia.

METHODS OF ADMINISTERING ANESTHESIA ETHER AS AN ANALGESIC

In using the new ether as an analgesic it is not necessary to learn new and complicated methods of administration, and it is suggested that the method be followed that is most familiar to the operator.

Satisfactory results usually can be obtained by dropping the ether directly from the container onto an open mask; in fact, many cases of minor operations have been reported to us where the desired effect was produced merely by inhaling the vapors from a saturated towel, napkin, or gauze. From ten to twenty slow and deep inspirations are generally sufficient to induce analgesia in the average case, and the condition is maintained by additional inhalations from time to time as required. Momentary retention of the breath before exhaling enables the ether to function most effectively.

Although the simpler methods of administering this special type of ether usually give satisfaction, it is desirable, as with ordinary anesthesia ether, to use when possible more efficient and scientifically correct apparatus in which the ether vapor concentration can be closely controlled. Such apparatus not only conserves ether, but it enables one to obtain more quickly and more surely the desired results.

Care should be taken not to push the administration of the ether too strongly, since the analgesic stage precedes full anesthesia and unless the ether is carefully administered the patient may pass quickly through the analgesic condition into complete anesthesia.

TESTS FOR ANALGESIA

It is usually noted that during primary induction the pulse rate increases until the stage of complete analgesia is reached, after which there is a decrease to about normal. Also, at the point of complete analgesia the pupil is somewhat dilated, and when covered, may wander. A positive test for analgesia is to insert a needle at least one-quarter inch in a region where muscle tissue will be encountered.

CAUTION

It is of importance to note that recovery from the influence of Du Pont Anesthesia Ether (Cotton-Process) is more rapid than in a case where ordinary anesthesia ether is used, and, therefore, the administration should be continued well beyond the stopping point in present practice with anesthesia ether. In other respects it is only necessary to observe those precautions which are taken when ordinary anesthesia ether is administered.

ILLUSTRATIVE CASES

The following records of the use of the improved anesthesia ether (Cotton-Process) in various operations for both anesthesia and analgesia are taken from an article published by Dr. Cotton in the American Journal of Surgery, April, 1919, and from our own files. It is thought the reports will prove interesting, and also, possibly, to some extent instructive:

THYROIDECTOMY

Anesthesia

CASE 1—Administration direct from container on open mask. Patient, female; age 41; weight 104 lbs.; pulse 120; operation thyroidectomy. Previous medication 1/8 gr. morphin and 1/200 gr. atropin 20 minutes before anesthesia. Administration: pulse immediately after induction was 110. During the operation it dropped to 100, then to 80. On recovery it registered 108. Time of induction 3 minutes; time of operation 1 hour. Patient recovered sufficiently to speak in 20 minutes. Was somewhat drowsy for several hours. Amount of ether used 5 ounces. No after-nausea. Surgeons: Drs. Perfect and Harrison.

BREAST AMPUTATION

Anesthesia

CASE 2—Administration direct from container on open mask. Patient Mrs. C.; age 70;

weight 112 lbs.; operation, breast amputation. Administration: time of induction 6 minutes; operation 1 hour. Amount of ether used 5.5 ounces. No after-nausea and patient recovered before reaching room. Stated she had enjoyed going under. Surgeons: Drs. Hay and Wesley.

MISCELLANEOUS

Anesthesia

CASE 3 (Collective) — Oxygen semi-closed. Gwathmey apparatus. The value of this method was first drawn to the attention of Dr. Cotton by Dr. J. F. Baldwin of Grant Hospital, Columbus, O., who was the first surgeon to use Du Pont Anesthesia (Cotton-Process) Ether in any moderate series of major cases. The technic is one of Dr. R. A. Rice's "Perfected Methods of Anesthesia" (described in the American Year-Book of Anesthesia and Analgesia, 1915-1916), in which oxygen, from a low pressure tank, is led through the Gwathmey three-bottle, dosimetric vapor apparatus, with its ascending and descending percentage control, and the saturated oxygen-ether vapor, washed and moistened in the warm water bottle, is conducted by means of a rubber tube to a closely fitting face mask, or oral airway, to which is attached a rebreathing bag. Baldwin reported 20 abdominal operations carried out, from start to finish, with this apparatus and method of anesthesia. The amount of ether used averaged from 1 to 3 ounces. The recovery was more rapid and the after-effects less than those occurring with ordinary ether. With this ether and method it was possible to induce anesthesia by the vapor method, whereas, previously, with other tinned ether, ethyl chlorid was always used for induction and almost double the amount of ether was found necessary for maintenance.

TONSILLECTOMY

Anesthesia

CASE 4—Modified Vapor Apparatus Devised by Dr. Cotton. Patient, nurse; age 28; weight 125 lbs.; operation removal of tonsils. Time for induction 4 minutes; complete surgical anesthesia apparently obtained. Time for removing

first tonsil 2 minutes; patient then completely awake but without feeling. She carried on conversation for 3 minutes, then mask was reapplied; anesthesia reinduced in 1 minute. The same rapid recovery after removal of second tonsil. Soreness in throat was not detectable for over one-half hour and during this period patient took nourishment. She considered the whole procedure a very pleasant experience. Amount of ether used 1.5 ounces. Throat reflex present before each tonsil was completely removed. Surgeon: Dr. Perfect. Witnesses: Drs. H. Harrison and Carveth.

CHOLECYSTECTOMY and APPENDECTOMY

Anesthesia

CASE 5—Modified Vapor Apparatus Devised by Dr. Cotton. Patient, female; age 35; weight 115 lbs.; operation cholecystectomy and appendectomy. Time of induction 5 minutes. Previous pulse 100; pulse during operation 70; relaxation during first part of operation easily obtained. Duration of operation 1 hour and 20 minutes. Amount of ether used 3.5 ounces. Regurgitated 4 ounces, but did not remember it or suffer from after-nausea. Patient was able to talk while being returned from the operating room. Surgeons: Drs. Perfect and Harrison.

EXTRACTION OF WISDOM TOOTH—EXCAVATION OF CAVITIES

Analgesia

CASE 1—Bottle Inhaler. "I took the ether myself, had a wisdom tooth removed and was conscious all the time. In fact I told the dentist when to remove it. Did not feel any pain whatever. I then administered it several times to volunteer patients for excavating sensitive cavities, which proved very satisfactory. At the Dental Convention at Swampscott, Mass., I had four patients—all for excavating, which was done without pain or loss of senses. The method of administration was from a four-ounce bottle with by-pass and glass tubes for insertion in the nostrils, connected with the bottle by rubber tubing. The analgesia lasted long enough to

prepare one cavity. I think perhaps a nose mask would be better, as the patient could inhale while the work was being done on the tooth. I think it only a matter of time before it will be universally used."—*Dr. E. W. Marven, Lynn, Mass.*

LAPAROTOMY

Analgesia

CASE 2—Open mask administration direct from container. Base Hospital, Toronto; Male; weight 150 lbs.; age 48; operation, resection and cauterization of part of abdomen for cancer; time of operation, 1 hour. Patient capable of talking throughout and quite clear mentally. He complained of being hungry before the hour was up. Pain returned within 3 minutes of cessation of anesthetic. Ether used, 3 ounces.

LAPARATOMY

Analgesia

CASE 3—Open mask administration direct from container. Male; age 18; weight 180 lbs.; operation, adhesions and resection of tubercular mass from abdomen. Time of operation, 1 hour and 10 minutes. Patient remained very clear mentally and cracked jokes throughout. He was given a small meal while the surgeons were operating on him. Abdomen was completely relaxed. Eyes were slightly dilated and pulse remained at 80. Amount of ether used, 3 ounces.

OPENING ABSCESS

Analgesia

CASE 4—Open mask administration direct from container. Male; aged 48; weight 132 lbs.; operation, opening and scraping abscess. Time for induction, 5 minutes. Senses dulled and unable to talk clearly. Length of operation, 12 minutes. Amount of ether administered, 2 ounces. Patient held his breath for one-half minute during recovery, which was complete in one minute. Patient then changed tables himself. There were no after-effects. Surgeon: Dr. Harrison. Witness: Dr. Carveth.

BREAST AMPUTATION

Analgesia

CASE 5—Open mask administration direct from container. Female; weight 180 lbs.; age 42; operation, breast amputation; time of operation, 45 minutes; anesthetist, Dr. Carveth. Patient capable of talking throughout whole of operation. She had no pain whatever and could not feel on what part of the body they were working. Ether used, 5 ounces.

ARM OPERATION

Analgesia

CASE 6—Open mask administration direct from container. Male; aged 33; weight 190 lbs.; returned soldier; operation, opening arm. Patient complained of feeling dull, but otherwise felt normal. Time of operation, 45 minutes. Time of induction to analgesia, 6 minutes. While under he stated he did not simply want to lose sensation to pain but that he wished to go to sleep, as he was tired. Amount of ether used, 3½ ounces. At two previous operations it was impossible to induce him with commercial ethers and chloroform had to be resorted to.

APPENDECTOMY

Analgesia

CASE 7—Open mask administration direct from container. Comparison of Cotton-Process Ether with ordinary chloroform-ether mixture. Patient, aged 24, on account of a recent attack of pneumonia, was to be operated on under local anesthesia for an acute appendiceal condition. She was given 1/4 gr. morphin and 1/200 gr. atropin as a preliminary, as she was exceedingly nervous. At 11 P. M. she entered the operating room, and the skin over the site of the operation was carefully infiltrated with 0.1 per cent. anocain solution. Six minutes later the incision was made, but the patient was unable to stand further manipulation on account of the deep soreness of the underlying abscess. At the request of the surgeon the houseman started the administration of the C-E

Mixture. The patient became excited, and after 1½ ounces had been used, she dropped into a light sleep, but the abdominal muscles were extremely rigid and there was a tendency to stop breathing. The incision made through the anterior aponeurosis was followed by severe muscular spasm. The use of an ampule of the special ether on the open mask was then suggested. The patient was allowed to wake up and the special ether was then given on the open mask, without the usual surrounding towel. Within four respirations her muscles relaxed completely and she was entirely without sensation, although she was able to answer questions clearly and was not excited, and would do anything requested. The operation continued and the abdomen was opened. The appendix had not ruptured, but the whole of the cecum was adherent to the abdominal wall and pelvis. One ounce of the special ether had been used by this time and, as another ampule had to be fetched from the storeroom, the C-E Mixture was again administered to note its effect. Sensation returned and the patient became blue if the C-E Mixture was pushed. The special ether was again used. The patient woke up and was able to talk. Her abdomen again relaxed. Operation continued for one hour. Adhesions were broken down and the appendix successfully removed. Three ounces of the special ether was used. During its use, at any time during the operation, the patient could have walked as easily as she talked. Afterwards she remembered answering questions but did not know anything about the operation while under the special ether.

One peculiar fact was noted. While under the special ether the pulse ranged about 80 and under the C-E Mixture it would immediately rise to 120. The patient stated that she was hungry and thirsty during the operation, as she was also afterwards. There was slight dilation of the pupils, but otherwise they were normal. They would roam about when covered, but fixed on any object when allowed to see.

Patient was as clear mentally at the end of the operation as at the beginning. Pain

recurred within 3 minutes after cessation of the anesthetic.

REDUCTION OF FRACTURE

Analgesia

CASE 8—Modified Vapor Apparatus devised by Dr. Cotton. A woman had been knocked down by a motor car and had her clavicle fractured. She was prejudiced against taking any anesthetic until told that she could give it to herself. The patient talked throughout the whole operation and was entirely without pain until six minutes after the anesthetic was stopped. She then stated that she wanted more of it as it made her happy. There were, of course, no after-effects. Major Harrison, of the British Army, was in charge of this case. A second case was undertaken with this same apparatus. The patient was 70 years of age and weighed 110 lbs. The operation was to open a knee joint. It required 2½ minutes to induce analgesia. The time of operation was 12 minutes. About one ounce of ether was used and the patient was not at any time abnormal mentally.

ABSCESS OF AXILLA

Analgesia

CASE 9—Administration direct from container by the open drop method. Complete analgesia was secured over a period of five minutes, during which time the patient was fully conscious and experienced no pain while the abscess was being opened. No nausea. Surgeon: D. F. Busteed.

AMPUTATION OF DISTAL PHALANGE

Analgesia

CASE 10—Modified Vapor apparatus devised by Dr. Cotton. The patient, a young colored boy, was given the ether by means of this semi-closed type inhaler. In about five minutes he was insensible to pain, although able to carry on a conversation. He laughed and talked a great deal, and said he felt very queer and that he was sure he was dead. The operation consisted of the amputation of the distal phalange of

the thumb, and lasted about 15 minutes. Occasionally the patient would feel some pain, but he did not realize what was being done and was very much surprised when the operation was over. He recovered quickly without vomiting and went back to work in an hour or so. Surgeon: W. H. Stocks, Wilmington, Del.

PREGNANCY AT TERM

Analgesia

CASE 11—Administration direct from container on open mask. Age, 17 years; primipara. Labor slow and tedious. Administered small quantity of ether. Very little pain. Second stage, pains severe, ether administered with much but not entire relief of pain. Patient entirely conscious. No nausea.

ASPIRATION IN ADVANCED TUBERCULOSIS

Analgesia

CASE 12—Open mask administration direct from container. Patient, colored; age 35. Patient had several severe hemorrhages from the lung, and sputum contained abundant tubercle bacilli. Complications developed that indicated a pleural effusion—marked flatness over the left side, extending to the back and marked pain over region of the heart. Restlessness and severe dyspnœa. Temperature from 100 to 104. Respiration 35.

It was decided the next day to remove the fluid in the chest by aspiration. The temperature was 100.3. Pulse 100. Patient was placed in the recumbent position and Du Pont Anesthesia Ether (Cotton-Process) given as directed until sensation to pain was abolished. During this stage there was no irritation of the respiratory passages whatsoever (demonstrated, when present, by an irritable cough). The trochar was introduced between the sixth and seventh ribs on the left side, near the axilla. The patient expressed no discomfort while witnessing the insertion of the trochar. Removed with only slight discomfort (pain and cough which were promptly relieved by deep inhalation of the ether) three quarts and eight ounces

of fluid from the chest. The entire left side was then strapped. Time consumed, forty minutes.

The next day the patient was feeling very much more comfortable than before. Temperature, 102.3. Pulse 100.

A few days later the patient was walking about feeling greatly relieved from the symptoms above mentioned.

Deductions: First, absence of irritation to the respiratory tract; Second, absolute control of the irritating cough during and following aspiration of fluid from the lung; Third, absolute control of the pain accompanying the operation. The conclusion was that Du Pont Anesthesia Ether (Cotton-Process) was the ideal anesthesic for this sort of a case. Quantity of ether used c.c. No nausea. Surgeon: W. H. Kraemer, Wilmington, Del.

MISCELLANEOUS

Other Cases:

Open mask administration direct from ampule.

15 Obstetricals: These patients were entirely relieved from pain, without reduction of the expulsive effort. Six were primiparae, and in four forceps had to be resorted to. One case was an induced delivery of a dead fetus at 8 months, while in another instance operative measures were required on account of hydrocephalus.

59 Cases of successful analgesia reported by Dr. Walter G. Hudson, New York.

9 Dental cases reported by Dr. Carveth,

32 Dental cases reported by the Dental Department of the Toronto General Hospital,

6 Breast abscesses,

40 Administrations for dressings,

1 Epispadias operation,

2 Hernias,

4 Varicoceles,

4 Abdominal operations.

We fully appreciate that only through the fullest co-operation with consumers can our products reach their highest development and widest field of usefulness, and with this object in view comments from our customers will always be welcomed.

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(A-914-August '19)

123

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HAMILTON June 26th. 1919.

Doctor Britton,
Sup't. General Hospital,
Toronto, Ontario.

Dear Doctor:

It would please me very much if you would have the kindness to act for me as one of the members of the Eaton family, to see that Dr. James H. Cotton is put on the inside surgical staff. I cannot speak too highly of the Doctor, and I would appreciate it very much if you would kindly see that this is done for me.

Yours very sincerely,

W. J. Eaton

DR. JAMES COTTON, M.A., M.D.
24 EAST BLOOR STREET
TORONTO

Oct. 2nd, '19.

Dr. I. H. Cameron,
Professor of Surgery,
University of Toronto,

Dear Dr. Cameron,-

Feeling that my position in surgery on the staff of the University of Toronto has been unfairly taken from me, I beg to draw the attention of the board to the following facts.-

The serious illness of my father culminating in his death in January 1916, prevented me from actively engaging in war work until that time, although military training was undertaken. A few weeks later, it was my good fortune to discover anew war anaesthetic capable of inducing general analgesia without narcosis. The inthusiasm of Dr. C. K. Clarke, after witnessing a case, resulted, unknown to me, in an editorial in the Toronto Press. This kindly act of Dr. Clarke's, which although fully appreciated, made it incumbent on me to resign all anaesthetis staff positions, as well as, unethical to even administer an anaesthetic for other than experimental or demonstration purposes.

After the approval of this Ether, at the Dominion Association in June, it was offered in its entirity to the Toronto University, and General Hospital combined. Although the Dupont Smokless Powder Works were willing to give any royalty for its privileges, they were completely ignored, and it was not until January 1917 that in desperation I gave it outright to that firm for developement, under the condition that they supply the allied armies free of cost.

DR. JAMES COTTON, M.A., M.D.
24 EAST BLOOR STREET
TORONTO

This exasperating silence on the part of the Toronto University and the General Hospital delayed matters to such an extent that with my utmost aid financially, and otherwise, it was impossible for the Dupont firm to supply this material much before the conclusion of the war.

In reference to military service oversess, might say that upon personal application I was considered medically unfit by the official staff at the armories. Failing in this, my services were again offered, free of charge, to Col. Ryerson, in the capacity of a chemist as in this capacity the Dupont people have recognized me as one of the first in the United States, but unfortunately my services were again unneeded.

Surgery being my aim in life, a permanent appointment was granted me as an assistant to Dr. S. M. Hay, at the conclusion of my career as an anaesthetist in June 1917. During this last trimester, I have been teaching in the Out-Patient Dept. of the Toronto General Hospital. Dr. Milner, head of this dept. informed me in July that my work had been quite satisfactory, but even though this is the case, I find within the last few days, that my surgical appointment has been taken from me. The transitary appointments in Anatomy, and Biology, were resigned by me this summer.

It seems to me, that in perfecting Ether for war anaesthetic purposes I would make a larger contribution to the general good of wounded soldiers, than by acting as an individual in an hospital.

Yours very sincerely

A/J.

Toronto Western Hospital

Bathurst Street

Toronto, Oct. 8th 1919.

During the year that
Dr. James Cotton was assistant
in Clinical Surgery at the Western
Hospital I saw a great deal of
him and his work in the wards.
He was careful, energetic, and
systematic in his methods and
his leaving was a distinct loss
to the Hospital and to myself
as a teacher in Clinical Surgery.

A. H. Peabody.

DR. F. N. G. STARR
112 COLLEGE STREET
TORONTO

October 9th, 1919.

Sir Robert Falconer,
President, University of Toronto,
Toronto.

Dear Mr. President:

Dr. James Cotton tells me he is to have an interview with you to-day, and has asked me to say something about him.

During several years past I have seen a number of surgical cases with him, and have often been struck by the thoroughness with which he investigates the condition under consideration. Then again his work in connection with Ether has been, I think, a distinct advance.

He is young and sometimes over-enthusiastic, so much so that I have felt in duty bound to sit on him, but each time this has seemed to be borne with cheerfully!

Yours faithfully,

F. N. G. Starr

1. Dr. Cotton's appointment as assistant in surgery to Dr. S. M. Hay, at the Western Hospital, and clinical assistant in surgery on the University staff was granted him In 1917 and had nothing whatever to do with war conditions.

2. His military duties were fully performed.

3. In September 1918, at our instigation, Dr. Cotton resigned the Western staff, to be placed at the Toronto General.

4. The superintendent of the Toronto General Hospital was notified to this effect, by myself.

5. Dr. Cotton was provided for on the Out-door staff by Dr. Milner to give clinical instructions to third year students, at the request of Advisory Board.

6. The superintendent was again notified in June concerning Dr. Cotton.

7. In September 1919, Dr. Cotton's University appointment, was taken away from him thereby nullifying his Hospital work at the Toronto General Hospital.